

Smart Solutions to Domestic Waste Disposal

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DECLARATION

We, the undersigned team members declare that the work embodied in this project work hereby, titled “Smart Solutions to Domestic Waste Disposal”, forms our own contribution to the research work carried out under the guidance of Dr. Madhuri W, is a result of our own research work and has not been previously submitted to any other University for any other Degree/ Diploma to this or any other University.

Wherever reference has been made to previous works of others, it has been clearly indicated as such and included in the bibliography.

We, here by further declare that all information of this document has been obtained and presented in accordance with academic rules and ethical.

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*Note: No Abbreviations used in this Project Dissertation.

ABSTRACT

The current rapid growth of waste has now become a part of our society. We cannot get rid of the waste completely and forever. It is a global issue that needs to be addressed with a smart solution. Our project here focuses on the various kinds of waste that exists in the world starting from waste generation & handling to collection and ultimately disposal. And how our proposed Business Model could make this process much easy and efficient for all of us. Moreover, it provides modern day solutions for domestic waste prevention and the different smart techniques that could be used to keep the environment around human settlement clean and healthy.

INTRODUCTION

Waste is any substance which is discarded after primary use, or is worthless, defective and of no use. The main types of waste are divided into municipal or domestic waste, and industrial waste (commercial waste can sometimes be another main category).

- **Domestic waste** (or Municipal Solid Waste as it's referred to) – is waste that discarded from the public, and from our households. Examples are food, paper, plastic, yard trimmings, and so on.
- **Industrial waste** – comes from industrial activity, such as from mines, factories, mills, workshops and so on. Examples are mining (rubble, topsoil), agriculture (fertilisers, pesticides, animal waste), food processing, textiles, metal manufacture, and construction and demolition wastes (plasterboard, bricks, concrete etc.).

Solid waste issue: Sources, Composition, Causes

Solid waste management issue is the biggest challenge to the authorities of both small and large cities' in developing countries. This is mainly due to the increasing generation of such solid waste and the burden posed on the municipal budget. In addition to the high costs, the solid waste management is associated to the lack of understanding of different factors that affect the entire handling system.

Population increase, rapid urbanization, booming economy, and the rise in the standard of living in developing countries have greatly accelerated the rate, amount and quality of the municipal solid waste generation.

Domestic Waste or Municipal solid waste (MSW) is one of the important challenges to the environment. Municipalities; generally; are responsible for the waste management.

The composition of MSW varies significantly from one municipality to another and from country to country significantly. Such variation depends mainly on the life style, economic situation, waste management regulations and industrial structure.

MSW is subjected to the energy conversion technologies including gasification, incineration etc. However, the possible hazardous substances occurring in the ash should be considered carefully. In this respect, the composition of the waste will provide valuable information on the utility of the material for either composting or for biogas production as fuel via biological conversion.

RESEARCH AND ANALYSIS

The EPA estimated the amount of MSW generation in the United States with 254 million tons in 2013. The composition and classification by material of such MSW is given in the figure below.

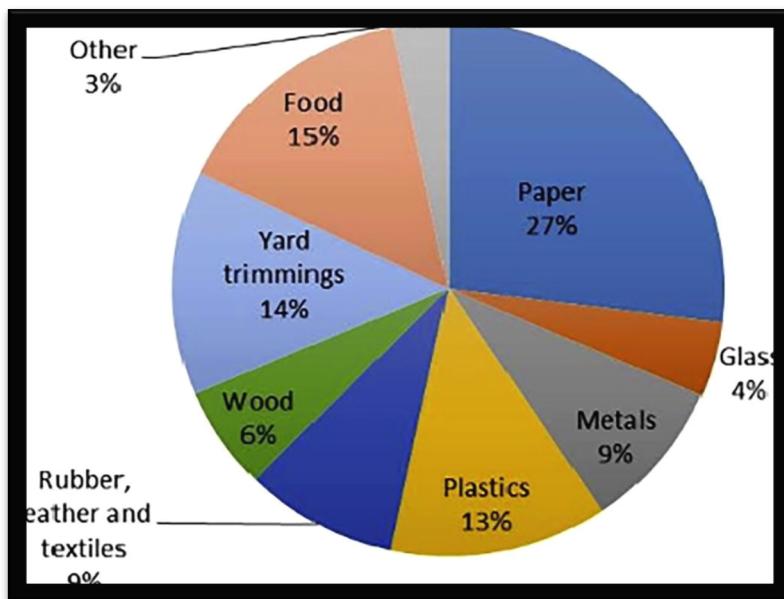


FIGURE 1: COMPOSITION AND CLASSIFICATION

Although it must be noted that The US may have a much higher per capita municipal waste rate than other countries. The US represents just 4% of the world's population, but it produces 12% of global municipal solid waste. In comparison, China and India make up more than 36% of the world's population and generate 27% of that waste (theguardian.com)

Several studies reported that the municipal solid waste that are generated from the developing

countries are mainly from households (55–80%), followed by market or commercial areas (10–30%).

Their composition are yard waste, food waste, plastics, wood, metals, papers, rubbers, leather, batteries, inert materials, textiles, paint containers, demolishing and construction materials as well as many others that would be difficult to classify. The heterogeneity of such generated solid waste is the major setback in sorting and its utilization as material.

Case Study I:

Test Data: India is rapidly turning into a Trash Bomb: 80% of 1.5 lakh metric tonne daily garbage remains exposed, untreated. India is getting buried in its own garbage as a huge quantity of solid waste generated daily is never picked up and poisons land, air and water.

Observation: Bar graph generated from a news article published in India Today July 21, 2019

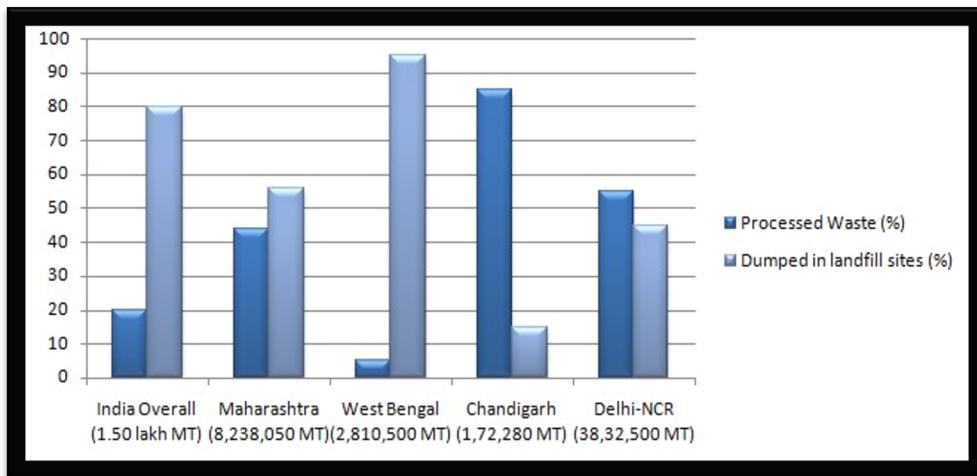


FIGURE 2: BAR GRAPH OF NEWS ARTICLES PUBLISHED

Case Study II: Methodology of Waste Audit in Urban India

Test Data: A waste audit was conducted across 500 households of Hyderabad, a city with a population of 3.6 million. The residents were divided into three segments by income levels: low, middle and high. Two housing societies in the “high income” segment, with 249 households, and two societies in the “middle income segment” with 251 households, were chosen for the waste audit.

Observation: The results indicated that there is a marginal increase in waste generation with rise in incomes.

	Average Waste Generated per day per Household (in kgs)			
	Wet	Dry	Hazardous	Total
'High income' households	0.902	0.378	0.216	1.496
'Middle income' households	0.887	0.235	0.200	1.322
Final Averages	0.894	0.306	0.208	1.409

FIGURE 3: PRIMARY RESEARCH RESULTS CONDUCTED ACROSS 500 HOUSEHOLDS

Case Study III: When Recyclables Are Wasted Along with Organic Waste

Test Data: Since source segregation is not enforced in majority of the cities in India, the segregation of recyclables from mixed waste is done by middlemen and rag-pickers at the dump yards. This drastically reduces the quality and quantity of recyclables that can be retrieved from the waste.

Observation: As illustrated in Figure 3, the reverse flow of money not only encourages residents to generate more trash but also makes dumping a more popular option to recycling or composting.

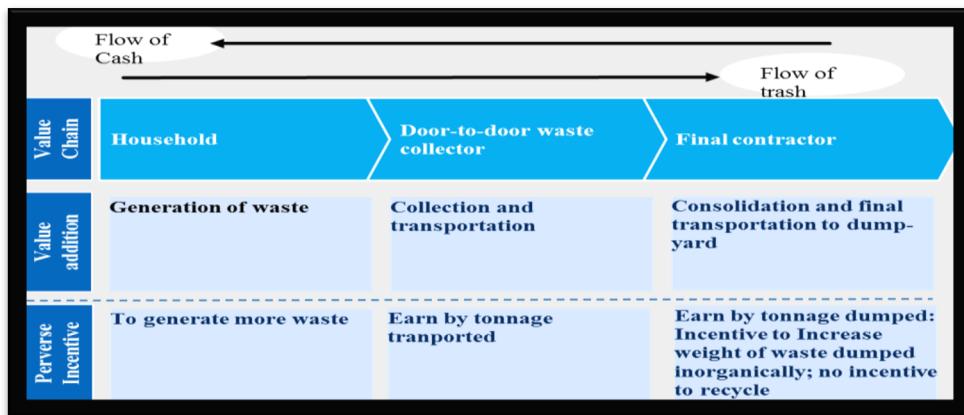


FIGURE 4: VALUE CHAIN OF WASTE COLLECTION

Statistical Highlights:

1. The food/kitchen waste constitutes about 75–80% part of domestic waste. Composition suggests its possible utility in compost and biomass energy production.

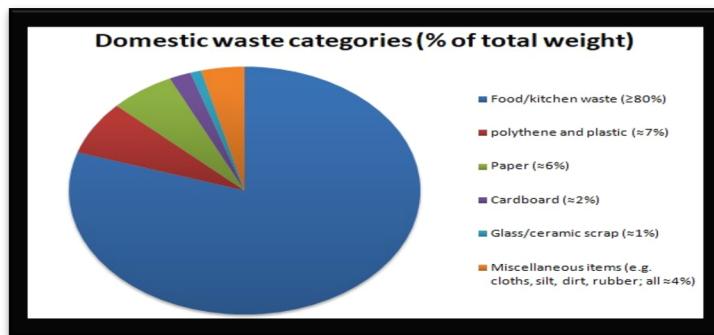


FIGURE 5: DOMESTIC WASTE CATEGORY

2. The domestic waste generation showed positive correlation with family size ($r_{xy} = 0.348$, $p < 0.01$)

This shows that while on the one hand, India needs highly scientific and automated mechanisms of managing the huge volumes of waste, on the other, facilities need to be decentralised to enable efficient management of end-to-end operations and save on transportation costs.

BUSINESS MODEL

We will be helping in this Waste Management process through an Organization. Our organization will have a mobile application. The mobile application will target 3 groups, customers, businesses and workers.

Customers: In our application we will have all the necessary columns so that the user can specify its location for giving the waste. They can schedule the waste pickups and our workers will reach them and collect. We will be providing various coupons to our users based on how much waste they are dumping. These coupons then can be used to buy products from businesses we have tie-up with.

Businesses: Businesses will use this app to register on our platform. Businesses that will collaborate will have products that are made out of recycled material. These products will be displayed in market place of Customers section.

Workers: Workers can register on app and see their schedule for pick-ups. They will be trained in how to work safe while collecting and segregating waste. Our organization will also provide trainings to workers with proper equipment.

Backend: Our app will work with latest Machine Learning techniques to reduce the amount of time consumed in collecting and segregating waste. It will calculate the most cost and time efficient ways for worker to move around the city and collect waste. It will also calculate on the amount of workers, vehicles and equipment needed for a particular area by analysing the past data we have collected.

Revenue generation: We can display ads on our app. People our currently giving waste for free, once they get to know about the incentives of registering on our app, like coupons and the social service aspect of our organization where we are working on the ground level with the workers to provide them a safe environment and proper employment. And so we can charge them monthly subscription fee. We can also charge Businesses for advertising their products direct to consumers on our platform.

APP LAYOUT/INTERFACE

*Host Site: <https://padm0069.github.io/Smart-solutions-to-Domestic-Waste-Disposal-/>

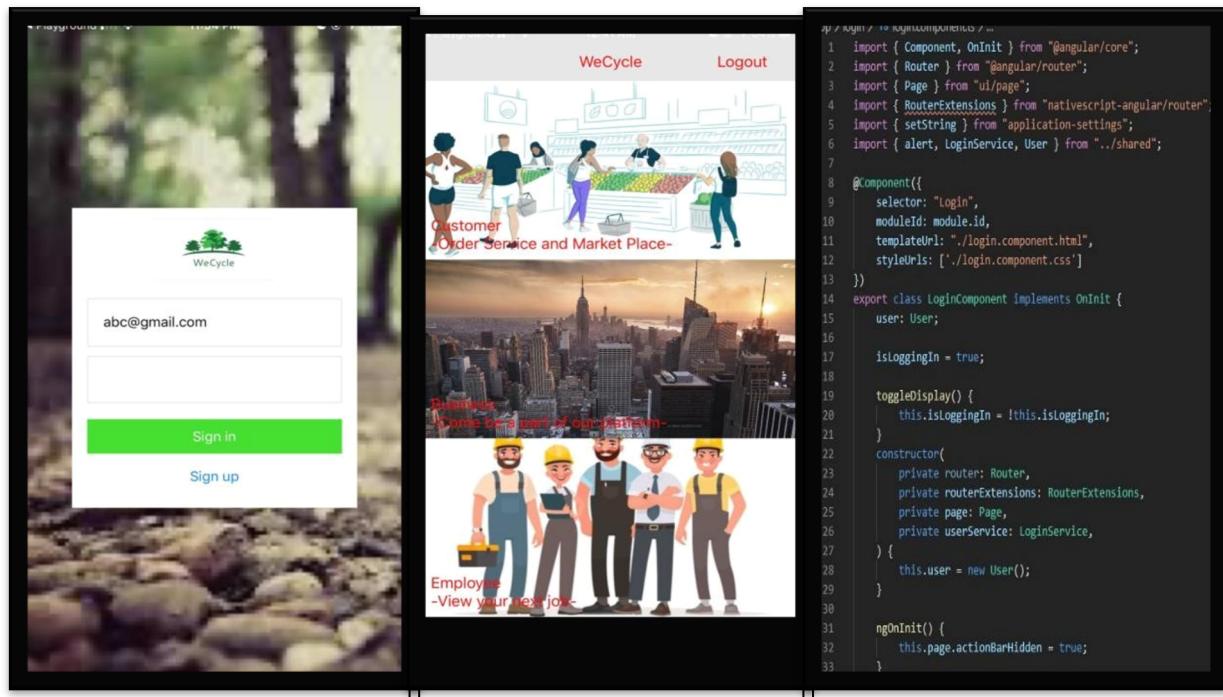


FIGURE 6: APP LAYOUT

*Supplementary Material contains source code as an open-source Contribution (GITHUB)

APP FLOWCHART

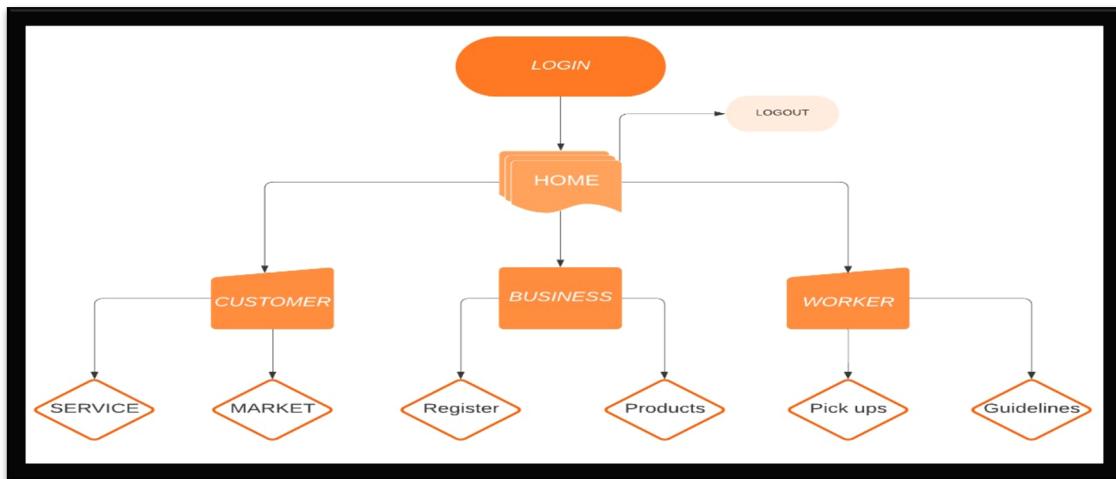


FIGURE 7: APP FLOWCHART

CURRENT FRAMEWORK OF INDIA

How can India handle the Situation?

Stemming the Faecal sludge tide:

A Centre for Science and Environment analysis suggests India's daily capacity to treat sewage is at an estimated 30% of material generated, with actual quantities treated at significantly lower levels. Add to this the increasing costs of water supply and distribution losses in urban areas, and cities are often unable to recover cost of supply, and consequently, left lacking in resources to invest in sewage treatment.

Shape leveraging technology and new jobs:

A technology-led approach is critical for accelerating progress in a heavily stigmatized area, typically serviced by the most marginalized populations working in high-risk conditions. The existence of insanitary latrines (dry toilets) and structural problems with poor construction of septic tanks result in the continuing of this occupation.

Adoptable ways of waste generation at the Source – FOR FUTURE

1. Deposit-refund scheme for cans and drinking bottles in EU and UK is a commendable scheme for waste management, as it incentivizes the consumer to return the bottle or can for

- which he/she is compensated, and it reduces pressure on landfills, increasing the life cycle of the product.
2. Sweden has set a benchmark when it comes to waste management and recycling. About 99% of the waste in Sweden is recycled and only 1% goes to landfills. In fact, their landfills are so empty that apparently, Sweden has to import waste from other countries. Of the 4.4 million tons of household waste produced by the nation every year, 2.2 million are converted into energy by a process called waste-to-energy (WTE).
 3. The coastal town of Alappuzha, India, has found a spot in a United Nations (UN) report of five global cities that have successfully tackled solid waste management. Under the project Nirmala, the city has adopted decentralised waste management and is pushing for 100 per cent segregation in all the 23 wards of the city.

The Start of The Smart Waste Disposal Era:

India's largest sewage treatment plant to come up at Okhla: DJB

New Delhi-The Delhi Jal Board (DJB) approved setting up of a new sewage treatment plant (STP) at Okhla which, it claimed, will be the largest such plant in India. The plant will be able to treat 124 million gallons of wastewater per day and will come up at a cost of Rs 1,161 crore in three years. The new STP will be set up under the Yamuna Action Plan - III scheme. The plant will treat the wastewater that goes into the Yamuna directly. It's a major step towards cleaning the river. The STP will remove 41,200 kg organic pollutant load per day and 61,600kg solid load per day on the Yamuna.

How this will Help in INDIA:

- India has a large number of workforce and labour; therefore, smart disposal systems can create new jobs or increase the number of workforces in a particular organization.
- India is currently employing technologies that would convert the non-disposable wastes into sources of energy. As India is one of the largest wastes generating countries, it would directly convert its bane to its best boon. Waste Management will lead to decrease of diseases for those who attend to segregation of the waste.

SOLUTIONS AND TECHNIQUES FOR WASTE DISPOSAL & PREVENTION

1. Promoting a reverse vending machine which gives free restaurant, movie and other coupons associated with eco-partners when a transparent plastic bottle is deposited to it.

This leads to sending plastic to recycling plants.

2. Trading garbage for free medical services and medicines. The clinics takes in the trash and sells it to recyclers. Then money collected is spent on providing basic health insurance to everyone including the poor. While people throw away the trash on roads, in rivers and so on, these schemes will be led them to treasure that trash. Thereafter, the trash will not end up causing pollution rather reach the recycling companies. The amount of labour and efforts and health issues that arise in order to segregate them at the end will decrease drastically.
3. Even today, most of the waste ends up in landfills than to be incinerated in plants. It can help in the process of generation of electricity. The methane gas produced in landfills is 72 times more potent as a greenhouse gas than carbon dioxide gas produced during incineration.
4. Contamination of soil and groundwater due to landfills affects our food and water intake. Landfills can be constructed with a synthetic membrane to prevent mercury from escaping into soil and groundwater. The toxins can be drained through a collection of pipes and discharged into a sewer system where they can be retained, incinerated or converted into fertilizer.
5. Reduce daily unnecessary use of plastics like straws and cutlery. Investing in few good quality reusable items like reusable water bottles, lunch boxes & cups can make a huge difference in the amount of plastic that you're sending to landfill and into the environment.
6. Buy items with least packaging, recyclable wherever possible and in bulk which helps reduce the amount of retail products being manufactured by industries on a large scale and thus reducing the amount of raw materials being used and waste being generated.
7. Reducing and Reusing are the two major components that help prevent huge heaps of waste from piling up. Businesses can often modify their current practices to reduce the amounts of waste generated by changing the design, manufacture, purchase, or use of materials or products. Like:
 - Reducing Office paper waste by implementing a formal policy to duplex all draft reports and by making training manuals and information available electronically.
 - Using incoming packaging materials for outgoing shipments
8. Donating excess products and unwanted supplies to local schools or non-profit Organizations or exchanging materials through a commercial materials exchange helps a

lot in saving raw materials for the future generation and generating less waste as it's an efficient process.

STATEMENT OF INNOVATION

- The proposed project seeks to eradicate the poor management of domestic waste disposal by developing an app interface between the garbage collector and the user and is implemented through various parameter of testing....
- We seek to shift current research and clinic paradigms by studying large diverse participant groups.
- This approach is innovative because it uses the full-scale implementation of interface technology to connect the low laying largely underpaid and underacknowledged garbage collectors and the users who will be more responsible and organised towards their garbage disposal hence creating the balance required for sustaining the Enviromint with no harmful adversaries.

STATEMENT OF NOVELTY

The disposal of domestic waste with smart solutions was compared with its resources and its functionality as suggested and it shows a positive trend regarding its development and implementation as directed with use of full-scale force to conjure its limitations in removal of the disadvantages it poses to advance its use for further purposes and such that it benefits a larger number of populations.

CONCLUSION

These all processes and initiatives that we have considered are highly effective as they have already been implemented in Kitsap County, Washington, Walt Disney Company, Eastern Illinois University, etc. and the results were proven to be very satisfying. Many huge industries are also changing their method of manufacturing and starting to adopt more effective and environment friendly aspects. Therefore, at the end of the day we can say that by incentivising in the right way we can maximise collection, minimise dumping and maximise recycling operations. These steps taken together can have a major effect in the way we deal with waste in our daily lives.

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